CRITIKON
VITAL ANSWERS™

DINAMAP™
Portable Adult/Pediatric and Neonatal Vital Signs Monitor
Model 8100
Operation Manual

LIST OF EFFECTIVE PAGES

U.S. Patent 4,349,034
U.S. Patent 4,360,029
U.S. Patent 4,501,280
U.S. Patent 4,546,775
Patent Pending

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DINAMAP™ Portable Vital Signs Monitor, Model 8100

SECTION 1. INTRODUCTION

GENERAL

The DINAMAP™ Portable Vital Signs Monitor 8100 is designed to noninvasively and automatically measure systolic and diastolic pressure, mean arterial pressure (MAP), and pulse rate for neonatal or adult/pediatric patients. Results are displayed on large, easy-to-read digital displays. The monitor will operate on AC line voltage or on its internal battery. The monitor will cycle automatically at operator programmed intervals between one and ninety minutes.

The DINAMAP™ Portable Monitor Model 8100 is effective and versatile. It continues to monitor during most clinical crises when other indirect measurement methods may fail. The monitor can be used in any hospital area where critical care is administered, for example, emergency room, operating room, recovery room, intensive care unit, cardiac care unit, renal dialysis unit, burn unit, etc.

MANUAL PURPOSE

This Operation Manual was prepared for the operator of the DINAMAP™ Portable Monitor Model 8100. This manual contains installation and operation instructions, device applications, limitations, and routine performance verification procedures. *To achieve satisfactory results, the operator must read this manual thoroughly before attempting to use the Monitor.*

MANUAL EFFECTIVITY

Reissues

Change to this manual, either in response to user input or to continuing product improvements, are accomplished through reissue.

Change Information Sheets

Changes occurring between reissues are addressed through Change Information Sheets and replacement pages. If a Change Information Sheet does not accompany this manual, it is correct as printed.

RELATED PUBLICATIONS

Instruction Labels

Two permanently affixed labels, one on each side of the monitor, contain condensed operation and alarm code information.

Service Manual

The DINAMAP™ Portable Monitor Model 8100 Service Manual (328-370) contains service and repair parts information directed to qualified service personnel.

WARNING

To avoid personal injury, the user should not perform any servicing unless qualified to do so.

SERVICE POLICY

The warranty for this product is enclosed with the product in the shipper carton. All repairs on products under warranty must be performed or approved by Critikon Company LLC personnel. *Unauthorized repairs will void the warranty.* Products not covered by warranty should be repaired only by qualified electronics service personnel.

EXTENDED WARRANTIES

Extended warranties may be purchased on most products. Contact your Sales Representative for details and pricing.

ASSISTANCE

If the product fails to function properly, or if assistance, service, or spare parts are required, contact Critikon Customer Support. Before contacting Critikon, it is helpful to attempt to duplicate the problem and to check all accessories to ensure that they are not the cause of the problem. If you are unable to resolve the problem after checking these items, contact Critikon. Prior to calling, please be prepared to provide

- ☐ product name and model number
- ☐ a complete description of the problem

ASSISTANCE
Cont.

If the repair parts or service are necessary, you will also be asked to provide

- ☐ the product serial number
- ☐ the facility's complete name and address
- ☐ a purchase order number if the product is to be repaired or you order spare parts
- ☐ the facilities Critikon account number, if possible
- ☐ the 6-digit part number for spare or replacement parts

SERVICE

If your product requires warranty, extended warranty or non-warranty repair service, call Johnson & Johnson Medical Customer Support and a representative will assist you. Estimates for non-warranty repairs are provided at no charge; however, the product must be sent to the Critikon Service Center in order to provide you with an estimate.

To facilitate prompt service in cases where the product has external chassis or case damage, please advise the Customer Support representative when you call.

The Customer Support representative will record all necessary information and will provide you with a Return Authorization Number. Prior to returning any product for repair, you must have a Return Authorization number. Call Critikon at

1-877-274-8456

and select Parts, Product Service, and Customer Support (press 2) Monday through Friday, 8:00 a.m. to 8:00 p.m. EST, excluding holidays.

Packing Instructions

Follow these recommended packing instructions.

- ☐ Remove all hoses, cables, sensors, power cords and ancillary products such as printers and external battery packs from the monitor before packing.
- ☐ Pack only the accessories you are requested to return; place them in a separate bag and insert the bag and the product inside the shipping carton.
- ☐ Use the original shipping carton and packing materials, if available.

If the original shipping carton is not available

- ☐ Place the product in a plastic bag and tie or tape the bag to prevent loose particles or materials from entering openings such as hose ports.
- ☐ Use a sturdy corrugated container to ship the product, tape securely to seal the container for shipping.
- ☐ Pack with 4 to 6 in. of padding on all sides of the product.

Insurance

Insurance is at the customer's discretion. Claims for damage to the product must be initiated by the shipper.

SERVICE LOANERS

A loaner unit is provided at no charge during the service life of the product when the repair service is performed by Critikon. Within 48 hours of your request, a loaner will be shipped to your facility.

- ☐ Critikon will pay shipping charges for a loaner sent to the customer for product repairs under the warranty.
- ☐ Shipping charges for a loaner sent to the customer for product repairs not under warranty will be billed to the customer.
- ☐ Shipping charges for the return of a loaner to Critikon will be paid by the customer.

All loaners provided to customers must be returned within the specified time stated on the loaner agreement or a rental fee will be incurred.

REPAIR PARTS

Repair parts can be ordered via phone Critikon Customer Support or via FAX. Exchange replacement assemblies such as Circuit Board Assemblies also are available; ask the Customer Support representative for details.

Via FAX ---- 1-813-887-2410

Please allow one working day for confirmation of your order. All orders must include the following information.

- ☐ Facility's complete name, address, and phone number
- ☐ FAX number
- ☐ Your purchase order number
- ☐ Your Critikon account number

REPLACEMENT ACCESSORIES

Replacements such as hoses, sensors, etc. must be purchased from Critikon at 1-77-274-8456. Please have the 4-digit Reorder/Product Code of the item you wish to order, your purchase order and account number available.

SECTION 2. PRODUCT DESCRIPTION

OVERVIEW

The DINAMAP™ Portable Monitor, Model 8100, is designed to provide operator convenience and reliability when monitoring vital signs. Features that enhance the DINAMAP™ Monitor's operation follow.

UNIQUE OPERATING FEATURES

- ☐ FULLY AUTOMATIC PATIENT SELECTION AND MONITORING Senses cuff size and switches automatically from adult/pediatric monitoring to neonatal monitoring or vice versa. Can be programmed to make determinations automatically at various intervals between 1 and 90 minutes.

- ☐ NONINVASIVE AND OBJECTIVE
  Helps eliminate risks associated with invasive monitoring and subjective interpretation of auscultatory methods.

- ☐ OSCILLOMETRIC
  No microphones or external transducers are required.

- ☐ ARTIFACT REJECTION
  By observing pulsations of matched amplitude and frequency, the monitor is capable of eliminating most noise and motion artifact.

- ☐ SYSTOLIC SEARCH
  Tracks rapid pressure changes.

- ☐ AUDIBLE/VISUAL ALARM SYSTEM
  Provides a visual and audible indication if systolic or diastolic pressures, mean arterial pressure (MAP), or pulse rate fall outside of operator programmable high/low limits and of abnormal system conditions or hardware failure.

- ☐ COMPUTER INTERFACE
  Rear panel data interface terminal for routing data to host computer.

UNIQUE OPERATING FEATURES (Cont.)

☐ AUTOMATIC PRESSURE ZEROING
Microcomputer automatically establishes the zero pressure reference before each determination, thus reducing the need for constant calibration verification.

☐ PRIOR DATA RECALL
Recalls from up to 100 previous determinations during the last 99 minutes of elapsed time.

☐ DIGITAL DISPLAYS
Large, easy-to-read digital displays (via high intensity LEDs) provide continuous readout of the most recent patient parameter values.

☐ FULLY PORTABLE OPERATION
The monitor can be operated from a fully charged internal battery for a minimum of 6 hours (in 5 minute cycle mode with adult cuff attached) or from AC power using AC line power cord.

ACCESSORIES

The accessories listed are either standard items shipped with the monitor or optional items which can be ordered separately.

Standard Accessories	**Reorder No.**
	Regular (White)
DURA-CUF™ Bladderless Blood Pressure Cuff	
Adult	2774
Hose (blue), Pneumatic, 12 foot (Adult/Pediatric Cuffs)	8841
Power Cord (Domestic)	8884
(International)	8885
Operation Manual	328-380

Optional Accessories Not included as Standard Accessories	**Reorder No.**	
	Regular (White)	**Sterile (White)**
DISPOSA-CUF™ Neonatal Blood Pressure Cuffs		
Neonatal #1, 3 cm-6 cm	2638	8311
Neonatal #2, 4 cm-8 cm	2633	8312
Neonatal #3, 6 cm-11 cm	2628	8313
Neonatal #4, 7 cm-13 cm	2623	8314
Neonatal #5, 8 cm-15 cm	2619	

Optional Accessories Cont.	Reorder No.	
DISPOSA-CUF™ Soft Neonatal Blood Pressure Cuffs		
Neonatal #1, 3 cm-6 cm	2521	
Neonatal #2, 4 cm-8 cm	2522	
Neonatal #3, 6 cm-11 cm	2523	
Neonatal #4, 7 cm-13 cm	2524	
Neonatal #5, 8 cm-15 cm	2525	
DISPOSA-CUF™ Disposable Blood Pressure Cuffs	**Regular (White)**	**Infection Control (Yellow)**
Infant	2618	
Child	2613	
Small Adult	2608	2607
Adult	2603	2602
Large Adult	2643	2642
Thigh	2648	
DISPOSA-CUF™ Soft Disposable Blood Pressure Cuffs		
Infant	2500	
Child	2501	
Small Adult	2502	
Adult	2503	
Large Adult	2504	
Thigh	2505	
DURA-CUF™ Bladderless Blood Pressure Cuff		
Infant, 8 cm-13 cm	2783	(Rust)
Child, 12 cm-19 cm	2781	(Green)
Small Adult, 17 cm-25 cm	2779	(Royal Blue)
Adult, 23 cm-33 cm	2774	(Navy Blue)
Large Adult, 31 cm-40 cm	2791	(Wine)
Thigh, 38 cm-50 cm	2796	(Brown)

Optional Accessories Cont.	Reorder No.
Calibration Kit	8886
Hose (light blue), Pneumatic, 8 foot (Neonate Cuffs)	8840
Hose (blue), Pneumatic, 24 foot (Adult/Pediatric only)	8842
Model 902 Mobile Stand	0902
DINAMAP™ BP Accessory Pole	3207
DINAMAP™ BP Accessory Base	3208
DINAMAP™ BP Accy. Basket	3209
Accessory Bag	1902
Writing Tablet Holder	8812
Writing Tablet (25 tablets/cs)	8811
Tympanic Thermometer Conversion Kit	1402
P-81T Printer	8252
Service Manual	328-630

Note

The Calibration Kit is included as part of the Service Manual.

SECTION 3. PHYSICAL DESCRIPTION

The DINAMAP™ Portable Monitor Model 8100 is a microprocessor controlled noninvasive device housed in a blue plastic case. Performance and technical specifications for the Model 8100 follow. Tables 3-1 and 3-2 contain a general physical description of the monitor's controls, indicators, connectors, and operating requirements.

PERFORMANCE SPECIFICATIONS

CUFF PRESSURE RANGE

Adult/Pediatric	0 mmHg to 250 mmHg
Neonate	0 mmHg to 235 mmHg

INITIAL CUFF INFLATION

Adult/Pediatric	178 ± 15 mmHg
Neonate	125 ± 15 mmHg

SYSTOLIC DETERMINATION

Adult/Pediatric	(Maximum)	245 mmHg
	(Minimum)	30 mmHg
Neonate	(Maximum)	190 mmHg
	(Minimum)	30 mmHg

MAP DETERMINATION

Adult/Pediatric	(Maximum)	225 mmHg
	(Minimum)	20 mmHg
Neonate	(Maximum)	170 mmHg
	(Minimum)	20 mmHg

DIASTOLIC DETERMINATION

Adult/Pediatric	(Maximum)	210 mmHg
	(Minimum)	10 mmHg
Neonate	(Maximum)	160 mmHg
	(Minimum)	10 mmHg

BLOOD PRESSURE ACCURACY

Blood Pressure accuracy meets and exceeds proposed AAMI standards for non-invasive blood pressure accuracy. (AAMI standard: ± 5 mmHg mean error; 8 mmHg standard deviation.)

PERFORMANCE SPECIFICATIONS
Continued

PULSE RATE DETERMINATION

Adult/Pediatric	(Maximum)	200 bpm
	(Minimum)	40 bpm
Neonate	(Maximum)	220 bpm
	(Minimum)	40 bpm

PULSE RATE ACCURACY
± 3.5 percent

DETERMINATION TIME
20 seconds to 45 seconds typical; 120 seconds maximum

OVERPRESSURE CUTOFF

Adult/Pediatric	300 ± 30 mmHg
Neonate	235 ± 10 mmHg

TECHNICAL SPECIFICATIONS

Mechanical

DIMENSIONS

Height	8.8 inches
Width	6.7 inches
Depth	6.7 inches

WEIGHT
Approximately 8.6 pounds

COLOR
Blue case with black front panel

MOUNTINGS
Self-supporting on rubber feet or pole mountable.

PORTABILITY
Carrying handle recessed in top of monitor.

OPERATOR'S INSTRUCTIONS/ALARM INTERPRETATION
Abbreviated operator's instructions and alarm interpretations are located on side panel labels.

TECHNICAL SPECIFICATIONS(cont)

Electrical

POWER CABLE

Domestic–10 foot detachable blue-jacketed 16 gauge terminated with 3-prong hospital grade plug.
International–10 foot detachable blue-jacketed 16-gauge unterminated.

BATTERY

12 volt, 2.4 amp-hours. Six hour minimum operation (5 minute auto cycle w/adult cuff at 25 degrees C) with full charge (see Table 6-1, Battery Charging Characteristics).

POWER REQUIREMENTS

Input Power

0.4 amps max. at 100, 120 VAC
0.2 amps max. at 220, 240 VAC

Input Voltage

(Domestic)

120 VAC/60 Hz (nom.), 104-132 VAC, 47-63 Hz

Note: Evaluations performed by UL/CSA are applicable to 120V products only.

(International)

100 VAC/50 Hz (nom.), 88-112 VAC, 47-63 Hz
230 VAC/50 Hz (nom.), 194-268 VAC, 47-63 Hz

FUSE REQUIREMENTS

120 VAC/60 Hz–2 each, 0.5 amp, 3AG at 250 VAC
100 VAC/50 Hz–2 each, 0.5 amp, 3AG at 250 VAC
230 VAC/50 Hz–2 each, 0.25 amp, FST at 250 VAC

Environmental

OPERATING TEMPERATURE

+50°F to +104°F
+10°C to +40°C

STORAGE TEMPERATURE

-29°F to +167°F
-34°C to +75°C

HUMIDITY RANGE

0% to 95% noncondensing

ALTITUDE RANGE

-1000 feet to +15000 feet

BF SYMBOL: This symbol indicates the classification of this type of equipment is in compliance with IEC Publication 601-1 and BS 5724-1, Type BF.

ATTENTION: Consult accompanying documents.

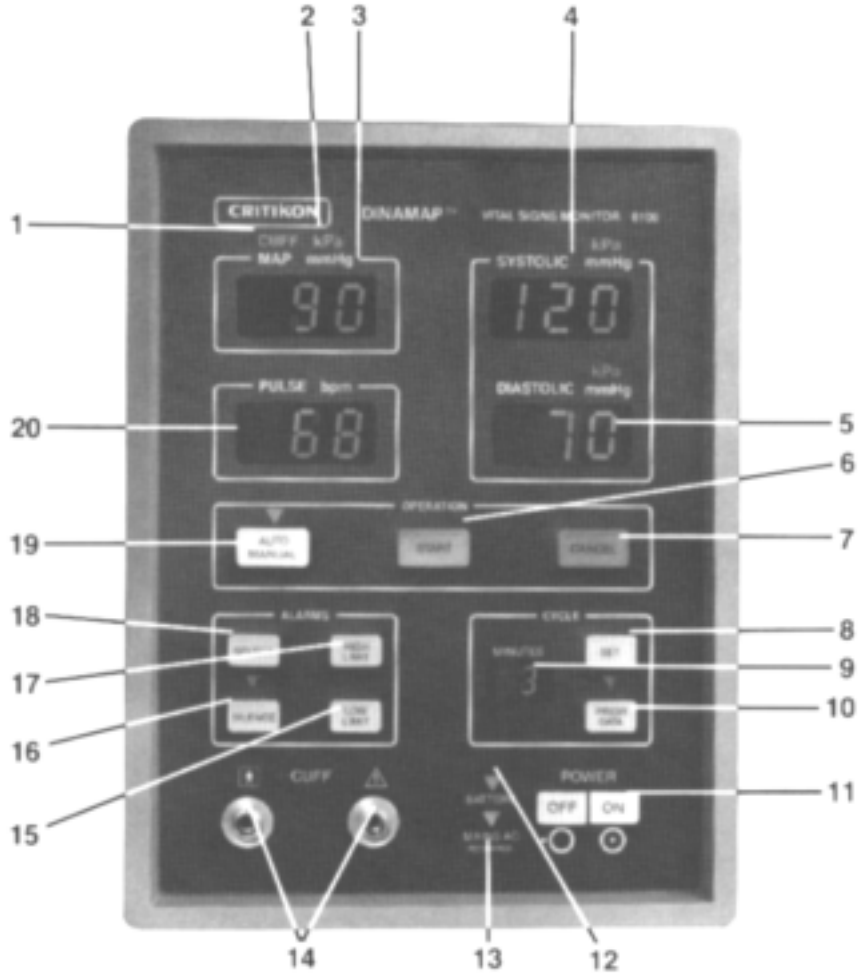

Figure 3-1. Model 8100 Front Panel Controls and Indicators

TABLE 3-1 MODEL 8100 FRONT PANEL CONTROLS AND INDICATORS

ITEM	NAME	FUNCTION
1	CUFF	This illuminated (amber) indicator signifies that a determination is in progress.
2	kPa	kPa (amber) indicator lights *only* if internal kPa jumper is installed.

TABLE 3-1 MODEL 8100 FRONT PANEL CONTROLS AND INDICATORS — Continued

ITEM	NAME	FUNCTION
3	MAP mmHg	This 3-digit red LED display shows mean arterial pressure. In addition this display: ☐ flashes cuff pressure during deflation time. ☐ shows MAP alarm limits (see Item 18, SELECT).
4	SYSTOLIC mmHg	This 3-digit red LED display shows systolic pressure. In addition, this display ☐ shows systolic alarm limits (see Item 18, SELECT).
5	DIASTOLIC mmHg	This 3-digit red LED display shows the diastolic pressure. In addition this display: ☐ shows diastolic alarm limits (see Item 18, SELECT).
6	START	This green momentary pushbutton switch initiates a determination in manual or auto mode. The START switch initiates a determination only during wait time; pressing START switch during a determination has no effect. In manual mode, determinations are initiated by pressing the START switch. In auto mode, pressing the START switch will initiate a determination and begin a new cycle.
7	CANCEL	This orange (red on older models) momentary pushbutton switch performs several functions. Pressing this switch will 1) terminate a determination in progress; 2) cancel all visual and audible alarms except certain system alarms (refer to Table 5-3, System Alarms Summary Table); 3) exit the calibrate mode; 4) exit patient alarm set routine; and 5) exit Prior Data Displayed Mode.

TABLE 3-1 MODEL 8100 FRONT PANEL CONTROLS AND INDICATORS — Continued

ITEM	NAME	FUNCTION
7	CANCEL Cont.	Visual and audible alarms may be canceled during wait time and the displays will maintain the last determined values.
8	SET	This grey momentary pushbutton switch increments the MINUTES display when in auto mode. The MINUTES increments are 1, 2, 3, 4, 5,10, 15, 20, 30, 45, 60, and 90 minutes. Holding the SET switch in for 4 seconds while momentarily pressing the ON switch places the monitor in calibrate mode, where it will remain for 3 minutes. Holding the SET switch for 20 seconds while momentarily pressing the ON switch will cause the monitor to remain in calibrate mode indefinitely.
9	CYCLE MINUTES	This 2-digit red LED display shows the cycle time (in minutes) when the monitor is placed into automatic mode. The display is normally blanked when in manual mode. In either mode, the elapsed time since the last data update (up to 90 minutes) is flashed in the CYCLE MINUTES display. When auto mode is first entered, the display indicates a default cycle time of three minutes. This cycle time can be changed by using the SET switch. Periodically, the elapsed time of the *current* cycle is displayed briefly to indicate the amount of time elapsed since the last data update.

TABLE 3-1 MODEL 8100 FRONT PANEL CONTROLS AND INDICATORS — Continued

ITEM	NAME	FUNCTION
10	PRIOR DATA	Depression of this switch will cause the monitor to display the data from the previous determination and the elapsed time (in minutes) since the determination was made. Pressing the switch a second time will display the data from the next previous determination, etc. A total of 100 previous determinations may be recalled (for up to 99 minutes). The monitor will exit the PRIOR DATA display if any other switch is pressed or if 10 seconds elapses with no activity. Placing the front panel power switch into the OFF position clears all stored data in memory.
11	*POWER ON - OFF	This white pushbutton controls the power to the monitor. If AC line power is attached to the rear panel, the battery charger will operate regardless of POWER ON/OFF switch position.
12	BATTERY	This yellow LED indicates that the monitor is operating on power from the internal battery. Flashes when less than approximately 10% battery charge remains.
13	*MAINS AC RE-CHARGE	This green LED indicates that AC line power is present and battery is being charged.
14	CUFF CONNEC-TOR	Screw type connectors for connection of pneumatic (cuff) hose.

* For very old units that have an AC power switch on the rear of the monitor, the power switch must be in the '**I**' position for the statements in items 11 & 13 to apply.

TABLE 3-1 MODEL 8100 FRONT PANEL CONTROLS AND INDICATORS — Continued

ITEM	NAME	FUNCTION
15	LOW LIMIT	This grey momentary pushbutton switch displays the current low alarm limit that you select (SELECT switch). If you push and hold this switch, you will cause the display to step through the entire range of low limit settings (settings overlapping the high limit will not be displayed.) The new low limit alarm setting will be the setting that is displayed at the time you release the LOW LIMIT switch.
16	SILENCE	This grey momentary pushbutton switch with LED indicator alternately mutes and enables the audio alarm. When pressed (SILENCE ON) the LED indicator lights to indicate that the audio portion of the alarms have been silenced. When an alarm condition is detected the LED will flash but no audio alarm will sound. Press again to enable audio alarm.
17	HIGH LIMIT	This grey momentary pushbutton switch displays the current high alarm limit that you select (SELECT switch). If you push and hold this switch, you will cause the display to step through the entire range of high limit settings (settings overlapping the low limit will not be displayed). The new high limit alarm setting will be the setting that is displayed at the time you release the HIGH LIMIT switch.

TABLE 3-1 MODEL 8100 FRONT PANEL CONTROLS AND INDICATORS — Continued

ITEM	NAME	FUNCTION
18	SELECT	This grey momentary pushbutton switch selects the alarm limits to be displayed. Depressing the switch the first time: ☐ blanks all displays except SYSTOLIC, and ☐ allows the HIGH LIMIT and LOW LIMIT switches to be used to display (set) the high and low systolic alarm limits in the SYSTOLIC display. Pressing the switch a second time: ☐ blanks all displays except MAP, and ☐ allows the HIGH LIMIT and LOW LIMIT switches to be used to display (set) the high and low MAP alarm limits in the MAP display. Pressing the switch a third time: ☐ blanks all displays except PULSE, and ☐ allows the HIGH LIMIT and LOW LIMIT switches to be used to display (set) the high and low pulse rate alarm limits in the PULSE display. Pressing the switch a fourth time: ☐ blanks all displays except DIASTOLIC, and ☐ allows the HIGH LIMIT and LOW LIMIT switches to be used to display (set) the high and low diastolic alarm limits in the DIASTOLIC display. Pressing the switch a fifth time: ☐ returns the values of the last determination to all displays. There is a 10-second time limit for each of these operations at which time the monitor automatically returns to the previous displays.

TABLE 3-1 MODEL 8100 FRONT PANEL CONTROLS AND INDICATORS — Continued

ITEM	NAME	FUNCTION
19	AUTO/ MANUAL Cont.	This white momentary pushbutton switch with adjacent LED indicators controls and indicates the mode of operation for the monitor. Pressing this switch changes the operating mode as indicated by the associated green LED. Manual mode is entered when power is first applied to the monitor. In manual mode, a single determination is made each time and only when the START switch is pressed. In the auto mode, one determination is initiated immediately. Subsequent determinations occur at the end of the cycle time shown in the CYCLE MINUTES display (Item 9). Determinations may be initiated at any time by pressing the START switch (during wait time). The cycle timer starts when auto mode is first entered and restarts at the beginning of each automatic or manually started determination.
20	PULSE bpm	This 3-digit yellow LED display shows pulse rate. In addition, this LED display: ☐ shows the alarm codes during certain alarm conditions. Refer to Section 5, Troubleshooting. ☐ shows pulse rate alarm limits (see Item 18, SELECT).

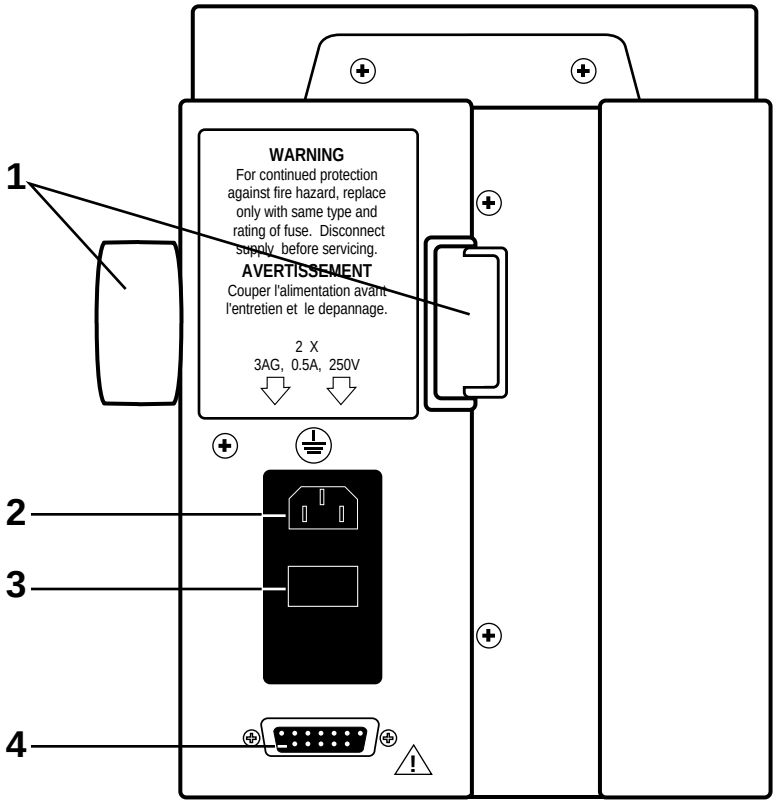

Figure 3-2. Model 8100 Rear Panel Controls and Indicators

TABLE 3-2 MODEL 8100 REAR PANEL CONTROLS AND INDICATORS

ITEM	NAME	FUNCTION
1	Pole Clamp	Clamps monitor securely to pole.
2	Line Power Connector	AC power cord connector.
3	AC Line Fuses	Contained under latched fuse compartment door. See Section 3, Electrical Specifications for ratings.
4	Data Interface Connector	Port for connection of external computer. **NOTE**: The Maximum non-destructive voltage which may be applied to any pin on the Data Interface Port is + 5v. Any connections made to these ports must be in accordance with the Service Manual.

SECTION 4. FUNCTIONAL DESCRIPTION

The DINAMAP™ Portable Monitor, Model 8100, is a fully portable, microprocessor controlled, noninvasive device that automatically measures systolic pressure, diastolic pressure, mean arterial pressure (MAP), and pulse rate for neonates, children, and adults using the oscillometric technique. Results are displayed on four large, easy-to-read digital displays. Determination interval can be selected by the operator in varied increments between one and ninety minutes. Two operating modes (auto and manual) are selectable to cover a variety of clinical situations and up to 100 previous determinations are stored in memory for recall and display.

Alarms are provided to alert the operator should systolic, diastolic, mean arterial pressures or pulse rate values exceed default* or operator-set high/low limits. The monitor provides external digital output for connection to a host computer.

DETERMINATION SEQUENCE

A determination sequence begins

- ☐ when the START switch is depressed in either manual, auto, or calibrate mode;
- ☐ upon entry into auto mode;
- ☐ when the cycle time has expired in the auto mode.

Refer to Figure 4-1, Determination Sequence. The first determination sequence initially pumps up to a cuff pressure of 178 mmHg for adult/pediatric patients, or 125 mmHg for neonates.

The monitor immediately begins a stepped deflation sequence and determines systolic pressure, MAP (mean arterial pressure), diastolic pressure and pulse rate from pulses induced in the cuff at the varied pressure levels. This is the oscillometric method of determination and is accomplished by a sensitive transducer which not only measures cuff pressure, but also minute pressure oscillations within the cuff.

*Default alarm limits are limits generally found useful in normal clinical situations. They should not be considered as safe limits for any particular patient.

DETERMINATION SEQUENCE
Continued

The monitor deflates the cuff one step each time it detects two pulsations of relatively equal amplitude. Time between deflation steps depends on the frequency of these matched pulses (pulse rate of patient). However, if the monitor is unable to find any pulse within 1.6 seconds, it deflates to the next step. The process of finding two matched pulses at each step provides rejection of artifact caused by patient movement and greatly enhances the accuracy of the monitor.

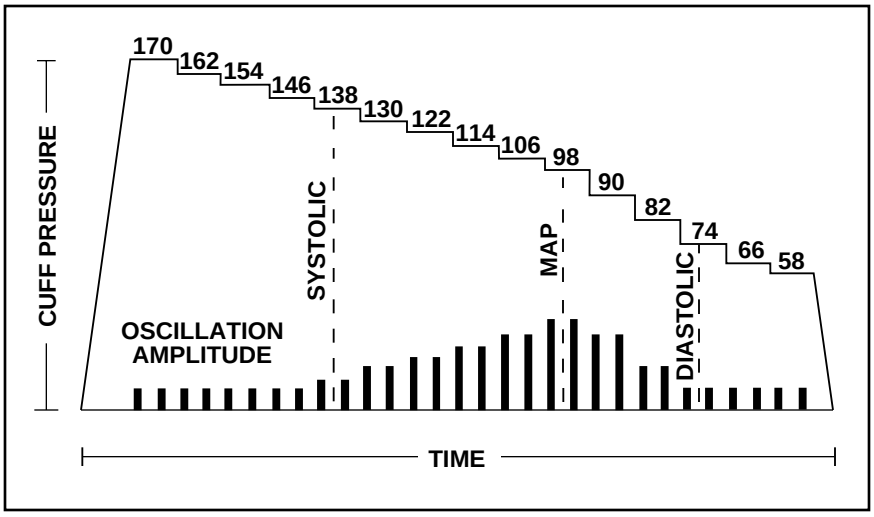

Figure 4-1. Determination Sequence

At each step the microprocessor stores cuff pressure, the matched pulse amplitude, and the time between successive pulses. The stepped deflation and matched pulse detection continues until diastolic pressure is determined or when total cuff pressure falls below 7 mmHg. The monitor then deflates the cuff, analyzes the stored data, updates the front panel displays, and sounds a short audio tone.

MAXIMUM-MINIMUM RANGES

Maximum and minimum ranges of Blood Pressure and Pulse Rate determinations and show in Table 4-1.

MAXIMUM-MINIMUM RANGES
Continued

TABLE 4-1. MAXIMUM AND MINIMUM DETECTABLE PRESSURE

Parameter	Neonatal		Adult/Pediatric	
Systolic Pressure	Max	190 mmHg	Max	245 mmHg
	Min	30 mmHg	Min	30 mmHg
Diastolic Pressure	Max	160 mmHg	Max	210 mmHg
	Min	10 mmHg	Min	10 mmHg
MAP (Mean Arterial Pressure)	Max	170 mmHg	Max	225 mmHg
	Min	20 mmHg	Min	20 mmHg
Pulse Rate	Max	220 bpm	Max	200 bpm
	Min	40 bpm	Min	40 bpm

BASIC OPERATING CYCLE

The operating cycle is comprised of four parts:

- ☐ inflation time,
- ☐ deflation time,
- ☐ evaluation time,
- ☐ and wait time.

Inflation time, deflation time, and evaluation time are the same for both modes of operation — auto and manual. Wait time is affected by the cycle time (auto mode) or operator intervention (manual mode). See Figure-4-2.

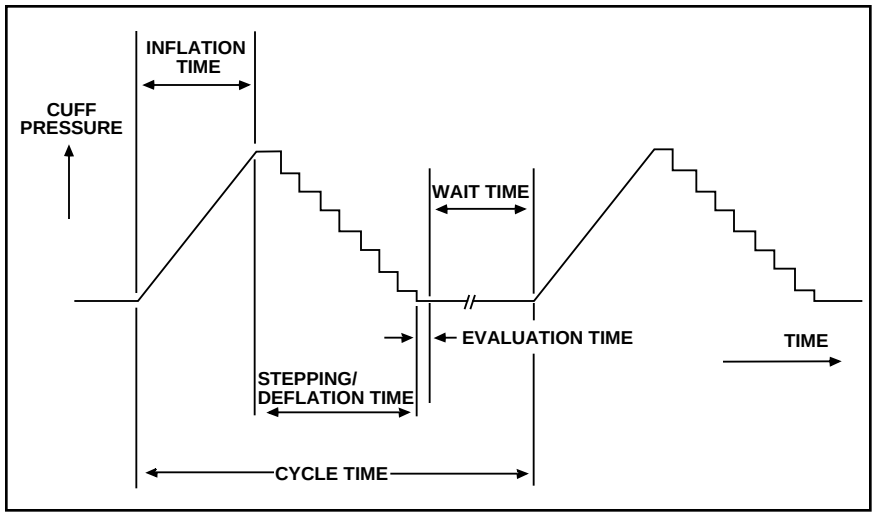

Figure 4-2. Basic Operating Cycle

OPERATING MODES

Manual Mode

The manual mode is the normal initial mode of operation for the monitor, the mode entered automatically after pressing the POWER ON switch. Default alarm limits automatically activate at power-ON but may be changed by the operator to suit any particular patient. (See Set Alarms Limits Procedure, Section 5.) In the manual mode, a single determination is made *only* when the START switch is pressed.

Wait time extends until the START switch is pressed again. Zero's appear automatically in the Vital Signs Displays after 1 minute, in Manual Mode.

NOTE

With software prior to RAN, Displays read zero after 90 minutes, in Manual Mode.

A determination may be canceled at any time by pressing the CANCEL switch. This action deflates the cuff, places the monitor back into the wait cycle and leaves any operator-set alarm limits unaltered.

Alarm indicators can be canceled (after a determination has caused and alarm condition) by pressing the CANCEL switch. This action silences and extinguishes all patient alarm indicators leaving operator-set alarm limits unaltered.

NOTE

Switching the monitor OFF (then ON again) will cause the monitor to clear (erase) all prior data and operator set alarm limits. Alarm limits return to default values and the monitor enters the manual mode.

Auto Mode

The auto mode may be selected by pressing the AUTO/MANUAL switch. In the auto mode, the first determination is initiated immediately. If a patient alarm is detected, another determination is initiated. Subsequent determinations occur at the interval time displayed in the CYCLE MINUTES display or at any time the START switch is pressed. Periodically, the CYCLE MINUTES display flashes the elapsed time since the last data update, then returns to the operator set cycle time.

OPERATING MODES Continued

A determination in progress may be canceled at any time by pressing the CANCEL switch. This action deflates the cuff and begins a new wait cycle (as displayed in the CYCLE MINUTES display). Any operator set alarm limits are unaltered. Alarm indicators can be canceled (after a determination has caused an alarm condition) by pressing the CANCEL switch. This action silences and extinguishes all patient alarm indicators, begins a new wait cycle (as displayed in the CYCLE MINUTES display), and leaves operator set alarm limits unaltered.

Neonatal or Adult/Pediatric Monitoring

The monitor automatically switches between neonatal and adult/pediatric monitoring by detecting cuff size at the beginning of a determination. No operator intervention is required. Default adult/pediatric or neonatal alarm limits are switched *only* if limits have not been set or viewed. However, if alarm limits have been viewed or set. the monitor retains those limits.

Systolic Search

In any operating mode, should a patient's systolic pressure exceed the monitor's pump-up pressure, the unit will

1. begin normal deflation sequence,
2. detect the absence of a systolic value,
3. stop deflation,
4. reinflate to a higher (than initial) pump-up pressure (250 mmHg, maximum), and
5. resume normal deflation sequence.

The monitor continues to use a higher pump-up pressure through subsequent determinations made within 90 minutes AUTO MODE or on minute MANUAL MODE. If the patient's systolic pressure falls, the unit will then lower pump-up pressure accordingly.

UNDETERMINED SYSTOLIC AND DIASTOLIC PRESSURES

Under certain circumstances, the monitor may display only MAP and not display values for systolic and diastolic pressures. If the patient is in shock, the systolic/diastolic waveform has very low amplitude fluctuations as shown in Figure 4-3, Low Amplitude Waveform Diagram.

Because of the relatively small difference between systolic and diastolic pressure in a shock situation, only MAP can be accurately determined and only MAP will be displayed.

If this condition occurs while in auto mode, the monitor will attempt one or more additional determinations after a 15 second delay.

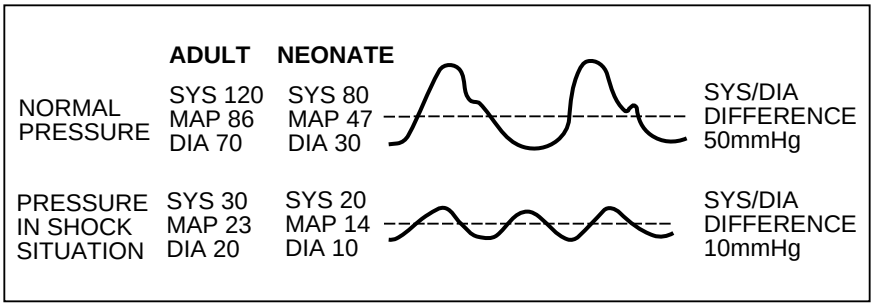

Figure 4-3. Low Amplitude Waveform Diagram

SECTION 5. INSTALLATION AND OPERATION

This section contains preparation and initial setup instructions, electrical and pneumatic hose connections, as well as cuff size and placement instructions. This section also contains indications and contraindications, operating precautions, and procedures.

UNPACKING

The monitor is shipped in a carefully designed corrugated carton. Inspect the exterior carefully for any signs of damage. Remove the monitor from the carton and inspect the monitor. Retain all shipping materials for inspection by the carrier in case of shipping damage or for reshipment, if necessary, to Critikon Company, LLC. Account for and inspect each item before discarding or storing the shipping materials.

Content Checklist

1 DINAMAP™ Portable Vital Signs Monitor, Model 8100
1 Operation Manual
1 Cuff, Standard Adult
1 Pneumatic Hose with Connectors, 12 ft. — Adult/Pediatric
1 Power Cord

MISSING ITEMS

For Catalog No 8100
If an item is missing or damaged, contact Technical Support at 1-877-274-8456

For Catalog No 8101
If an item is missing or damaged, contact Johnson & Johnson Professional Products Limited, The Bracans, London Road, Bracknell, Berkshire RG12 2AT. Telephone 0344 864090.

INDICATIONS AND CONTRAINDICATIONS

The DINAMAP™ Portable Monitor Model 8100 is intended for monitoring of blood pressure and pulse rate. The device is not designed, sold, or intended for use except as indicated.

The monitor should not be used on patients who are linked to heart/lung machines.

INSTALLATION AND INITIAL SETUP

Electrical and Hose Connections

If there is no apparent external damage to the monitor, follow these steps.

With monitor power off:

1. Check the voltage rating stamped on the serial number plate attached to the bottom of the monitor and make sure it matches the line voltage of the receptacle to be used.

2. UPON INITIALLY RECEIVING THE MONITOR, CHARGE THE BATTERY FOR A SIXTEEN HOURS by connecting the detachable 10-foot power cord to the monitor rear panel. Plug the other end into and appropriate voltage receptacle. (See Section 6, Maintenance for battery charging chart).

3. Connect the pneumatic hose to the monitor at the front panel. There is no preferred order of connection; either hose connector may be attached to either port. Thread the hose connectors onto monitor ports until finger-tight. DO NOT OVERTIGHTEN. The pneumatic seal is *not* made by tightening the connector.

4. Select the appropriate measurement site (see Figure 5-1). For neonates, the arm or leg can be used. For adults/pediatrics, the preferred location is the arm. When the arm cannot be used, placement on the ankle is preferred over the thigh since measurement on the adult thigh may be uncomfortable. When there is no suitable alternative for the thigh (e.g. shock), set the monitor's determination cycle to five (5) minutes or longer, unless the clinical situation requires more frequent measurement.

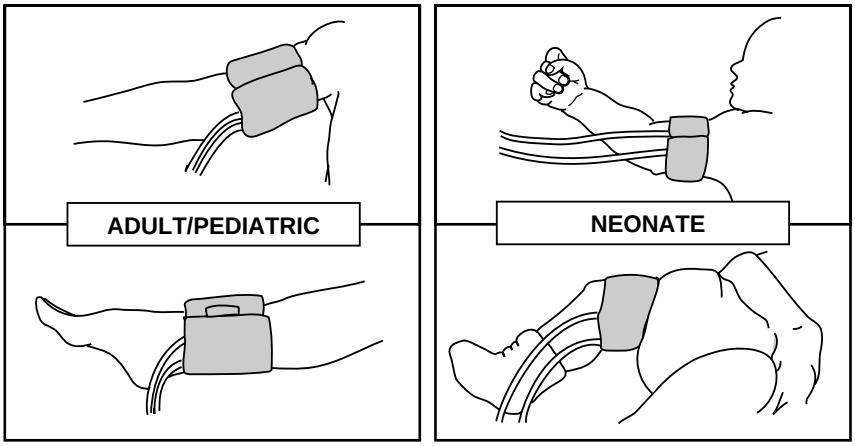

Figure 5-1. Recommended Cuff Placement

WARNING

Do ***not*** place the cuff on an extremity being used for intravenous infusion, or any area where circulation is compromised or has the potential to be compromised.

5. Measure the limb of the patient and select the proper cuff size according to the size marked on cuff or cuff package. See Table 5-1. The monitor's accuracy depends on use of the appropriate cuff and hose.

TABLE 5-1. CUFF-TO-HOSE COMPATIBILITY

CUFF TYPE	CUFF SIZE/LIMB CIRCUMFERENCE	HOSE LENGTH	HOSE NO.
Neonate #1	3 cm— 6 cm	8 ft.	8840
Neonate #2	4 cm— 8 cm	8 ft.	8840
Neonate #3	6 cm—11 cm	8 ft.	8840
Neonate #4	7 cm—13 cm	8 ft.	8840
Neonate #5	8 cm—15 cm	8 ft.	8840
Infant	8 cm—13 cm	12' or 24'	8841/8842
Child	12 cm—19 cm	12' or 24'	8841/8842
Sm Adult	17 cm—25 cm	12' or 24'	8841/8842
Adult	23 cm—33 cm	12' or 24'	8841/8842
Lg Adult	31 cm—40 cm	12' or 24'	8841/8842
Thigh	38 cm—50 cm	12' or 24'	8841/8842

6. Connect the cuff to the hoses. Thread the cuff connectors onto the hose connectors. DO NOT OVERTIGHTEN.

WARNING

It is mandatory that the 8-foot hose (Light Blue, Reorder No. 8840) be used with neonatal cuffs and the 12 or 24 ft. hoses (Blue, Reorder No. 8841/8842) be used with infant through thigh cuffs. Any attempt to modify hoses will inhibit the monitor from switching to proper mode.

7. Squeeze all the air from the cuff.
8. Place the cuff snugly on the patient as shown in Figure 5-1. In the case of upper arm placement, it is recommended to place the cuff as proximally as possible. Observe the mark on the inside of the cuff to be placed over the artery. Be sure the cuff is snug, but not so tight as to prevent venous return between determinations.

WARNING

Excessive tightness will cause venous congestion and discoloration of the limb, but a loose cuff may result in no readings and/or inaccurate readings.

9. If it becomes necessary to change the cuff to another limb, make sure the appropriate size cuff is used.
10. Before powering ON the monitor, read/review all operating precautions.

OPERATING WARNINGS, PRECAUTIONS, and NOTES

Although the DINAMAP™ Portable Monitor Model 8100 has been designed to provide safe and reliable operation in medical environments, a responsible operator will observe the following warnings, precautions, and notes to ensure the safe and reliable operation of this unit.

WARNINGS

- **In some cases, rapid, prolonged cycling of a non-invasive blood pressure monitor has been associated with ischemia, purpura and/or neuropathy. It is recommended to apply the cuff appropriately and to check the cuff site and cuffed extremity regularly when monitoring at frequent intervals and/or over extended periods of time.**
- **Vital signs may very likely be inaccurate if you use cuffs, hoses or accessories other than those provided by Critikon Company, LLC.**
- **The monitor will not operate effectively on patients who are experiencing convulsions or tremors.**
- **If a patient is encountering arrhythmias, the monitor's blood pressure determination time may increase and may even extend beyond the monitor's capabilities (120 seconds) causing an 844 system alarm.**
- **The monitor displays results of the blood pressure determination for 90 minutes or until another determination is completed. If a patient's condition changes during the time interval between determinations, the monitor will not detect the change or indicate an alarm condition.**

PRECAUTIONS

- **If the accuracy of any determination value is questionable, first check the patient's vital signs by alternate means and then check the monitor for proper functioning.**
- **Read and have a thorough understanding of the material presented in the manual.**
- **Read and observe all the caution and warning labels affixed to the monitor.**

PRECAUTIONS Cont.

- ☐ **Place the monitor on a rigid, secure surface or attach securely with the pole clamp.**
- ☐ **If the integrity of the electrical ground is in doubt, disconnect the power cord from the power source, and operate the monitor using internal battery.**
- ☐ **Arrange the power cord and pneumatic hoses carefully so they do not constitute a hazard.**
- ☐ **Verify calibration and ensure that all display digits are functioning properly before operating the monitor.**
- ☐ **Do not place fluids on the monitor.**
- ☐ **Do not use the monitor in the presence of flammable anesthetics.**
- ☐ **If the accuracy of any determination reading is questionable, first check the patient's vital signs by alternate means and then check the monitor for proper functioning.**
- ☐ **If monitoring blood pressure at frequent intervals, observe the patient's cuffed extremity for signs of impeded blood flow.**
- ☐ **To obtain accurate blood pressure determinations, extremity and cuff motion must be minimized.**
- ☐ **Monitor blood pressure accuracy is dependent on the application of the proper size cuff and hose. It is essential that limb circumference be measured and the proper size cuff be selected. See Table 5-1.**
- ☐ **If the cuff is not at heart level, the difference in the reading due to hydrostatic effect should be noted. The value of 1.80 mmHg must be added to the displayed readings for every inch above the heart level. The value of 1.80 mmHg must be subtracted from the displayed readings for every inch below heart level.**

PRECAUTIONS Cont.

- **The pulse rate displayed by the DINAMAP™ Monitor may differ from heart rate displayed by an ECG monitor because the DINAMAP™ Monitor measures actual peripheral pulse. Occasionally, electrical signals at the heart do not produce a peripheral pulse. Similarly, if a patient's beat-to-beat pulse amplitude varies significantly (e.g., *pulsus alternans,* atrial fibrillation, rapid cycling artificial ventilator), blood pressure and pulse rate readings can be erratic and an alternate measuring method should be used for confirmation.**

NOTE

- A patient's vital signs may vary dramatically during the administration of agents affecting the cardiovascular status such as those used to raise or lower blood pressure or raise or lower heart rate.

OPERATING PROCEDURES

The procedures described here are those steps you follow to operate the monitor. However, you should read Section 5 in its entirety to ensure responsible operation of the monitor.

POWER-ON PROCEDURE

1. Press the momentary pushbutton POWER ON switch (front panel) and observe that the monitor momentarily displays eights (888s) in all digital displays and flashes all indicators as a check for the operation of all LEDs. The audio alarm is also sounded as a check for its operation.

2. Set the audio SILENCE (ON/OFF) alarm switch on the front panel to the desired mode. In the SILENCE OFF state, the monitor generates and audio alarm for any alarm condition and the yellow LED indicator will flash. In the SILENCE ON state, the LED remains lit to indicate that the audio alarms are muted for all patient and excess time alarm conditions. When an alarm condition is detected the alarm will not sound but the yellow LED indicator will flash. A 900 series alarm cannot be silenced. (See Table 5-3, Systems Alarms Summary Table).

POWER-ON PROCEDURE
Cont.

3. Set the systolic, MAP, pulse, and diastolic alarm limits if it is desired that these limits be changed from the default values.

TABLE 5-2. DEFAULT ALARM LIMITS

	ADULT	NEONATE
SYSTOLIC high limit	240 mmHg	240 mmHg
SYSTOLIC low limit	*	*
** MAP high limit	140 mmHg	100 mmHg
** MAP low limit	50 mmHg	30 mmHg
PULSE high limit	220 bpm	220 bpm
PULSE low limit	40 bpm	40 bpm
DIASTOLIC high limit	130 mmHg	130 mmHg
DIASTOLIC low limit	*	*

* Alarm disabled until the alarm limit is set.

** After power-ON, MAP default alarm limits switch between Adult/Pediatric and Neonate limits depending on the type of cuff used. Once these limits are viewed or set they no longer will switch.

SET ALARM LIMITS PROCEDURE

The adult default alarm limits are in effect each time power is first applied to the monitor. If neonatal default alarm limits are desired, make one determination with a neonatal cuff and hose attached prior to inspecting or changing limits. See Table 5-2, Default Alarm Limits.

To change these limits, perform the following steps. However, note that if no switch is pressed within a 10-second period while setting limits, the monitor automatically returns to the normal display.

1. Momentarily press SELECT to enable the SYSTOLIC display to show the systolic alarm limits. All other displays will be blanked and the SYSTOLIC display will show zero (or the systolic value of the previous determination).

SET ALARM LIMITS PROCEDURE Cont.

2. Momentarily press HIGH LIMIT to display the current systolic high limit. Press and hold HIGH LIMIT to cause the monitor to increment through the high alarm range settings. Release the HIGH LIMIT switch at the desired setting. (Range: 75 to 240 mmHg)
3. Momentarily press the LOW LIMIT switch to display the current low limit in the SYSTOLIC display. Press and hold LOW LIMIT to cause the monitor to increment through the low alarm range settings. Release the LOW LIMIT switch at desired setting. (Range 30 to 150 mmHg)
4. Momentarily press the SELECT switch to enable the MAP display to show the MAP alarm limits. All other displays will be blanked and the MAP display will show zero (or the MAP of the previous determination if one was performed).
5. Momentarily press HIGH LIMIT to display the current high limit in the MAP display. Press and hold HIGH LIMIT to cause the monitor to increment through the high alarm range settings. Release the HIGH LIMIT switch at the desired setting. (Range: 70 to 200 mmHg)
6. Momentarily press the LOW LIMIT switch to display the current low limit in the MAP display. Press and hold LOW LIMIT to cause the monitor to increment through the low alarm range settings. Release the LOW LIMIT switch at the desired setting. (Range: 25 to 120 mmHg)
7. Momentarily press the SELECT switch to enable the PULSE display to show the pulse alarm limits. All other displays will be blanked and the pulse display will show zero (or the pulse of the previous determination if one was performed).
8. Momentarily press HIGH LIMIT to display the current high limit in the PULSE display. Press and hold HIGH LIMIT to cause the monitor to increment through the high alarm range settings. Release the HIGH LIMIT switch at the desired setting. (Range: 80 to 220 bpm)
9. Momentarily press the LOW LIMIT switch to display the current low limit in the PULSE display. Press and hold LOW LIMIT to cause the monitor to increment through the low alarm range settings. Release the LOW LIMIT switch at the desired setting. (Range: 40 to 140 bpm)

SET ALARM LIMITS PROCEDURE Cont.

10. Momentarily press SELECT to enable the DIASTOLIC display to show the diastolic alarm limits. All other displays will be blanked and the DIASTOLIC display will show zero (or the diastolic value of the previous determination).
11. Momentarily press HIGH LIMIT to display the current diastolic high limit. Press and hold HIGH LIMIT to cause the monitor to increment through the high alarm range settings. Release the HIGH LIMIT switch at the desired setting. (Range: 50 to 180 mmHg)
12. Momentarily press the LOW LIMIT switch to display the current low limit in the DIASTOLIC display. Press and hold LOW LIMIT to cause the monitor to increment through the low alarm range settings. Release the LOW LIMIT switch at the desired setting. (Range: 15 to 120 mmHg)
13. Momentarily press the SELECT or CANCEL switch to return the display to normal operation.

MANUAL MODE

To operate the Monitor in manual mode, follow this procedure.

1. Press START to begin each determination.
2. Press CANCEL to stop a determination and deflate cuff, or to cancel overpressure, excess time and patient alarm indicators.

AUTO MODE

1. Press AUTO/MANUAL to enter auto mode and start a determination. Auto mode is indicated by the LED above the AUTO/MANUAL switch and the appearance of the cycle time in the CYCLE MINUTES display.
2. Preset cycle time is three (3) minutes. To change the cycle time, press and hold the CYCLE SET switch until the desired cycle time appears in the display; then release the switch. The display will periodically flash the amount of time which has expired since the last data update. You may initiate a determination at any time during the wait period by pressing the START switch. This action resets the wait cycle.
3. Press CANCEL to stop a determination and deflate cuff, or to cancel excess time and patient alarm indicators.

ALARM INDICATIONS AND INTERPRETATION

All alarm indications are accompanied by an audio signal unless the SILENCE switch is in the ON state. In the SILENCE (ON) state, an alarm condition (other than a microprocessor system failure) is indicated by the flashing yellow LED indicator.

A microprocessor system failure will generate a continuous, high level audio alarm regardless of the setting of the SILENCE switch.

There are two categories of alarms, patient alarms and system alarms; these are described in the paragraphs following.

PATIENT ALARMS

Patient alarms include those alarms issued when the patient's systolic pressure, mean arterial pressure, pulse rate, or diastolic pressure is outside the set limits. Whenever one of these conditions occurs, the associated display (SYSTOLIC, MAP, PULSE, or DIASTOLIC,) will flash the determined value and an alternating high/low frequency audio alarm will be issued.

Pressing the SILENCE (ON/OFF) switch to on (yellow LED lit) silences the audio alarm, but the alarming parameter display and SILENCE LED indicator will continue to flash at the same rate.

Pressing the CANCEL switch cancels all patient alarm indications.

Whenever the monitor detects a patient alarm condition in auto mode, the monitor activates the alarms, waits 15 seconds and then begins one more determination (unless CANCEL is pressed). If the alarm condition persists, no further determinations are made until the cycle time elapses.

SYSTEM ALARMS

There are a number of system level alarms to alert the operator to certain abnormal conditions or internal system failures. See Table 5-3, System Alarms Summary Table. Alarm conditions and remedies are discussed in this section, Troubleshooting.

Pressing the CANCEL switch cancels all excess time system alarms, 855, 844, 833, 899, and the 800 overpressure alarm.

TABLE 5-3. SYSTEM ALARMS SUMMARY TABLE

PULSE DISPLAY	ALL OTHER DISPLAYS	LED INDICATORS	CANCEL SWITCH	PROBABLE CAUSE	OPERATOR ACTION
Flashes 899	Blank	Alarm flashes-others unchanged	Stops audio/ visual indicators	Monitor unable to make determination due to insufficient signal	Refer to Troubleshooting, following
Flashes 888 for 1 sec	888 for 1 sec	All toggle on/off	Has no effect	Normal at power-ON	No action required—normal at power-ON
Flashes 888 for 1 sec	888 for 1 sec	————	Has no effect	More than 3 min in Calibration Mode	If you desire to remain i Calibration Mode, turn power Off/ On while pressing SET for 20 seconds
Blank	Blank	————	Has no effect	Microprocessor Failure	Refer to Troubleshooting, following
Flashes 855 until next determination	Blank	Alarm flashes-others unchanged	Stops audio/visual indicators	At one pressure level for more than 60 seconds	Check for kinked hose refer to Troubleshooting, following
Flashes 844 until next determination	Blank	Alarm flashes-others unchanged	Stops audio/visual indicators	Determination time has exceeded 120 seconds	Restrain patient movement. Relocate cuff to another limb
Flashes 833 until next determination	Blank	Alarm flashes-others unchanged	Stops audio/ visual indicators	Inflation time has exceeded 30 seconds or air leak is detected	Check for leaks in cuff and hose connections Refer to Troubleshooting.
Flashes 800 continuously	Blank	Alarm flashes-others unchanged	Stops audio/ visual indicators. Stops 800 flashing. Zeroes Displays.	Overpressure detected	Refer to Troubleshooting.
Flashes 900 to 999 continuously	Blank	Alarm flashes-others unchanged	Has no effect	Internal malfunction	Refer to Troubleshooting, following

TROUBLESHOOTING

The DINAMAP™ Portable Monitor Model 8100 has been designed to provide safe and reliable operation in medical environments. As with all medical devices, if the accuracy of any determination value is questionable, first check the patient's vital signs by alternate means and then check the monitor.

Determination Unsuccessful Alarm (899)

This alarm is indicated by an alarm tone and a flashing 899 in the PULSE display. This alarm condition indicates that the monitor is unable to make a determination. Possible causes include: sudden changes in blood pressure; excessive arrhythmias; cuff too loose; or arterial obstruction. In auto mode, the monitor initiates two determinations at a higher pump-up pressure followed by seven determinations at the original pump-up pressure until a successful determination in made. No more than nine retries will be made if the 899 alarm condition persists. Move cuff to another location and attempt another determination.

Power-On Alarm (888)

The power-ON alarm occurs anytime that power is interrupted and then restored to the monitor, or after three (3) minutes in cal mode. The alarm lasts for three seconds, during which time the monitor displays all eights (888s) in the digital displays; toggles all LED indicators on and off and issues an audio tone.

After the alarm is issued, the monitor enters the manual mode of operation with adult default alarm limits in effect.

Excess Time at One Pressure Alarm (855)

This alarm is indicated by an alarm tone and a flashing 855 in the PULSE display. The alarm is generated if the cuff pressure is held at one pressure level for more than 60 seconds. Check the cuff and hose connections for kinks or blockages and then initiate another determination.

Excess Determination Time Alarm (844)
This alarm is indicated by an alarm tone and a flashing 844 in the PULSE display. The alarm is generated if determination time exceeds 120 seconds, which is usually caused by excessive patient movement and/or erratic pulse rate. Restrain patient movement and check the patient's pulse rate. Move the cuff to another location and try another determination.

Excess Inflation Time Alarm (833)
This alarm is indicated by an alarm tone and a flashing 833 in the PULSE display. The alarm is generated if the initial cuff inflation time exceeds 30 seconds and usually is caused by a leak in the pneumatic system. The alarm will also be generated if a leak is detected after a successful inflation. Check the cuff and hose connections for leaks and try another determination.

Excess Pressure Alarm (800)
This alarm is indicated by an alarm tone and a flashing 800 in the PULSE display. The alarm can only be cleared by pressing CANCEL or turning power off and on.

1. If the sensed cuff pressure remains higher than 20 mmHg for more than 20 seconds during the wait cycle.
2. If the sensed cuff pressure exceeds 300, ± 30 mmHg with an adult/pediatric cuff attached.
3. If the sensed cuff pressure exceeds 235, ± 10 mmHg with a neonatal cuff attached.
4. If the sensed cuff pressure exceeds 250 mmHg for a period longer than 20 seconds during a determination with an adult/pediatric cuff attached. The alarm can be cleared by pressing CANCEL or turning power off and on.
5. If sensed cuff pressure exceeds 50 mmHg for more than 3 minutes without going below 50 mmHg for longer than 4 seconds.

Check to see if the cuff *return* hose attached to the front of the monitor is kinked or otherwise blocked. If the alarm persists, it is an indication of a hardware malfunction. Refer to qualified service personnel.

Monitor Will Not Power-On

This condition could be caused by a depleted battery. Check fuse. Attach unit to AC power source. If problem persists, refer to qualified service personnel.

Monitor Displays Extremely High Readings

This condition could be caused by using a cuff that is too large or by the cuff being positioned above heart level. Use the proper size cuff or reposition cuff at heart level. If the cuff cannot be positioned at heart level, then compensate by subtracting 1.8 mmHg for every inch below heart level.

Monitor Displays Extremely Low readings

This condition could be caused by using a cuff that is too large or by the cuff being positioned above heart level. Use the proper size cuff or reposition cuff at heart level. If the cuff cannot be positioned at heart level, then compensate by adding 1.8 mmHg for every inch above heart level.

Patient Alarms Activate After Every Determination

This condition could be caused by narrow high/low alarm limits. Reset alarm limits as required (see Set Alarm Limits Procedure, Section 5) and try another determination.

SECTION 6. MAINTENANCE AND CALIBRATION

MAINTENANCE

Cleaning

The only maintenance routinely required is that the monitor and accessories are kept clean and are handled and used according to the instructions provided here and in the Service Manual (328-370).

The exterior of the monitor may be wiped clean with a cloth slightly dampened with mild detergents.

- ☐ Do *not* immerse unit.
- ☐ Do *not* clean with isopropyl alcohol or other solvents.
- ☐ Cuffs and hoses should be cleaned with a cloth slightly dampened with mild detergent.
- ☐ Do *not* immerse hoses.
- ☐ Do *not* immerse cuffs without prior application of cuff hose caps. (See caution statement in Calibration below).

The Adult Cuffs supplied for use with this Monitor may be cleaned by hand washing with warm soapy water. Care should be exercised, however, to ensure that no water enters the cuff or cuff hoses at any time. Should water accidentally enter the cuff it may be dried by passing air through the cuff.

Storage

If it becomes necessary to store the monitor for an extended period of time, disconnect the battery, attach the original packing inserts and place the unit into the original shipping carton. Refer to Section 3, Physical Description, Environmental Specifications for storage temperature information.

MAINTENANCE
Continued

Battery Charging

To charge battery simply attach AC line power cord to the monitor's rear panel line power connector *THEN* plug the opposite end into an appropriate AC receptacle. The battery will charge regardless of the position of any other switches (see following table for battery charging characteristics).

The battery must be recharged fully (6 hours) after 6-8 hours of continuous use. If the unit is used intermittently for an hour or two at a time, it must be charged per Table 6-1.

NOTE

On the older model and International units that have an AC power switch on the back of the monitor, place the switch in the "**I**" position for battery charging.

TABLE 6-1. BATTERY CHARGING CHARACTERISTICS

Hours of Use* On Battery Only	Typical Charge Time** Unit On (Hrs)	Unit Off
>6	6	5
5 - 6	5	3
3 - 4	4	2
2 - 3	2.5	1.5
1 - 2	2	1
<1	1	.5

** Charging at 25°C ambient temperature.

* Operating with standard adult cuff on 5 minute determination cycles at 25°C ambient temperature.

Repeated failure to fully charge the battery will result in a significant reduction in battery life.

NOTE

A *new* battery should be charged for a minimum of 4 hours before use.

Battery Removal and Replacement

It is best to keep the battery charged as fully as is practical and never store the monitor with the battery in a discharged condition. When the battery will no longer take a charge, remove it and replace it with one of the same part number (320-378) as outlined below.

NOTE

Battery removal and replacement must be done by qualified service personnel.

1. Ensure that AC power is removed from the monitor .

2. Take off the cover by removing the (5) screws and pole clamp knob as shown in Figure 6-1.

3. When the battery is visible, remove the battery cable slip-on connectors.

4. Connect the battery cable connectors to the new battery, ensuring proper polarity. Connect the red battery cable to the positive (+) terminal. Connect the black battery cable to the negative (-) terminal.

5. Replace the cover and knob. Then insert and tighten the screws.

6. Attach the AC power cord and plug it into an appropriate AC outlet. The battery will automatically start to charge, as described in Battery Charging Section.

NOTE

On the international units that have an AC power switch on the rear of the monitor, place the switch in the "**I**" position for the battery charging.

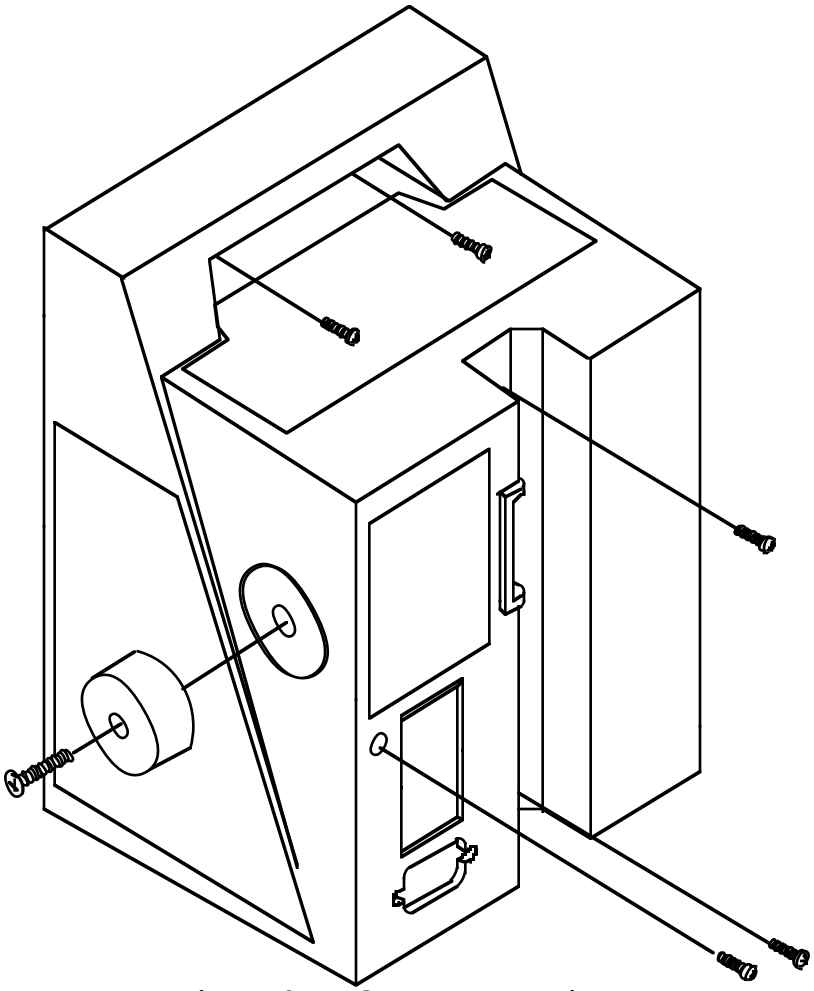

Figure 6-1. Cover Removal

Changing Fuses

The monitor contains three fuses. Two AC line power fuses are contained in the power entry module. One battery fuse is contained on the power supply board and is accessible only by qualified service personnel.

Replacement of Line Power Fuses

At the rear of the monitor, remove the power cord (if one is attached). Using a flat bladed tool such as a screwdriver or key, pry up the lower edge of the door below the power connector as shown in Figure 6-2 and swing the door upward on its hinge to reveal the two fuse holders.

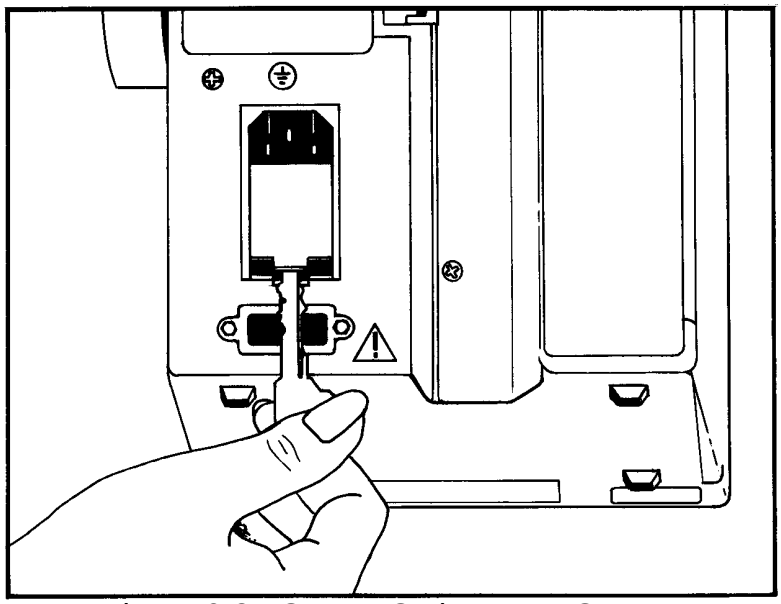

Figure 6-2. Open AC Line Fuse Compartment

Using the same tool, pry out each fuse holder as shown in Figure 6-3.

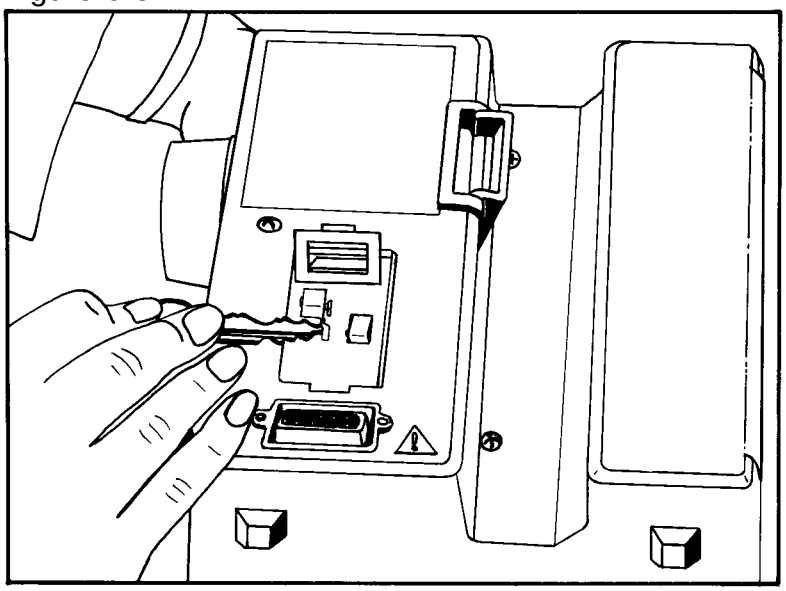

Figure 6-3. Remove Fuse Holder

Remove each fuse from its fuse holder as shown in Figure 6-4. and inspect it for a burned or broken filament. If the filament appears to be intact, check it for continuity with an ohmmeter. Replace the blown fuse with one of the exact same rating and type.

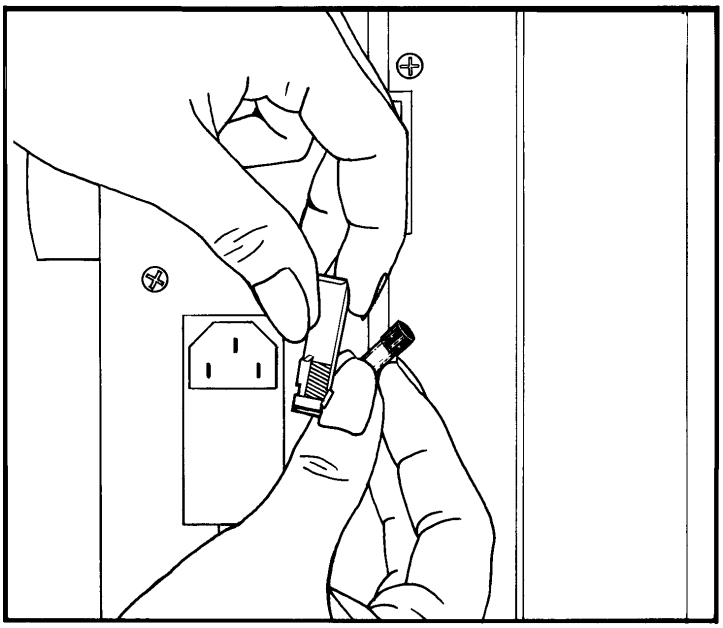

Figure 6-4. Remove Fuse From Fuse Holder

Replace the fuse and fuse holder as shown in Figure 6-5. Make sure that the arrows on the outward facing ends of the fuse holders are pointing in the same direction as the arrows on the inside of the cover plate. Snap down the cover plate.

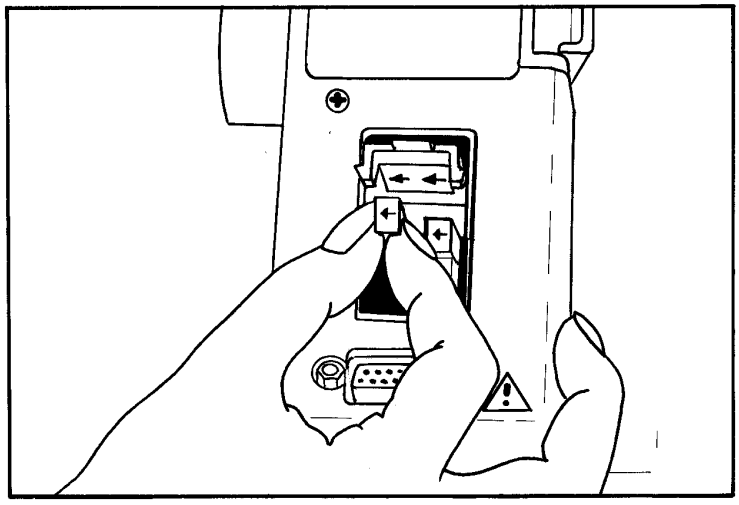

Figure 6-5. Replace AC Line Fuse and Fuse Holder

Replacement of Battery Fuse

Refer to qualified service personnel since placement of the battery fuse requires unit disassembly.

CALIBRATION

Calibration of the monitor should be checked at least once a year or when there is doubt about the validity of the pressure readings.

CAUTION

Calibration equipment should always be kept dry and free of particulate matter. Moisture or foreign substances introduced into the pneumatic system can cause damage to the unit.

BLOOD PRESSURE CALIBRATION CHECK

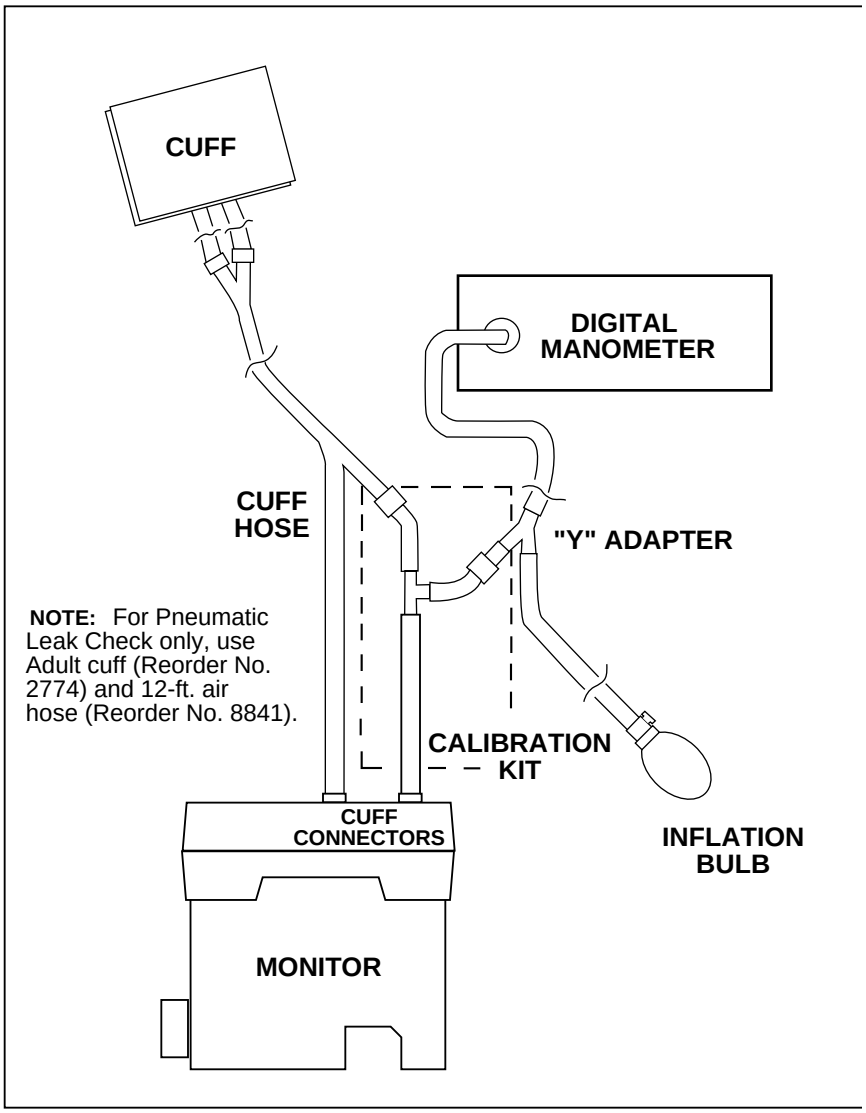

Figure 6-6. Calibration Check Setup

BLOOD PRESSURE CALIBRATION CHECK Continued

To perform a calibration check, follow these procedural steps:

1. Obtain the calibration kit (Reorder No. 8886) supplied with the unit.
2. Connect a mercury manometer (Baumanometer 300, or equivalent) to the monitor using the parts supplied with the calibration kit as shown in Figure 6-6. In calibration procedure, use Adult Cuff and Air Hose.
3. Plug the monitor into the specified line power outlet.
4. Clamp off the mercury manometer. Fold the adult cuff in such a way that the Index Line is in line with the Inner Range Mark on the inside of the cuff.
5. Press Front Panel OFF switch then press and hold the SET switch in for 4 seconds while pressing the Front Panel ON switch. Flashing 888s in the CYCLE MINUTES display indicate that calibration mode has been entered. The monitor will exit calibration mode if the CANCEL switch is pressed or after 3 minutes of inactivity. To remain in calibration mode indefinitely, hold the SET key for 20 seconds. The monitor will sound a short audio tone and remain in calibration mode until CANCEL is pressed. Cuff pressure will be displayed in the MAP display. Allow the monitor to stabilize for about 30 seconds, then press SET four (4) times to perform an auto-zero operation.
6. Using the inflation bulb, manually pump up the pressure to 200 mmHg, $\pm$ 2 mmHg, as indicated on the MAP display and close pneumatic release valve on inflation bulb.
7. Verify that the pressure indicated by the MAP display does not change more than 5 mmHg in 60 seconds.

NOTE

If the leakdown is greater than 5 mmHg in 60 seconds, isolate the source of the leak to either the cuff and hose or the monitor using cuff and hose leak test procedure which follows.

8. Release clamp from manometer tubing.
9. Verify that the MAP display (Pressure Reading) indicates the correct pressure as shown in Table 6-2, Calibration Check Pressure Levels.

BLOOD PRESSURE CALIBRATION CHECK Continued

TABLE 6-2 CALIBRATION CHECK PRESSURE LEVELS

MANOMETER INDICATED PRESSURE LEVEL	MAP DISPLAY
200 mmHg, ± 1 mmHg	200 mmHg, ± 5 mmHg
150 mmHg, ± 1 mmHg	150 mmHg, ± 4 mmHg
100 mmHg, ± 1 mmHg	100 mmHg, ± 4 mmHg
50 mmHg, ± 1 mmHg	50 mmHg, ± 4 mmHg
0 mmHg	0 mmHg, + 1 mmHg, - 0 mmHg

10. If the indicated pressures are not within tolerance, the monitor must be calibrated. Refer to qualified service personnel.
11. Pump up the manometer using the manometer bulb and, at a pressure between 265 mmHg and 355 mmHg, verify that the monitor briefly blanks the displays, opens the deflate valves, and then issues and 800 alarm.
12. If the overpressure point is not within tolerance (300 mmHg ± 30 mmHg), the overpressure switch must be adjusted. Refer to qualified service personnel.

CUFF AND HOSE LEAK CHECK

Performing a Cuff and Hose Pneumatic Leak Check

1. Obtain the calibration kit (Reorder No. 8886) supplied with this unit.
2. Connect a digital single-tube manometer with the parts supplied in the blood pressure calibration kit as shown in Figure 6-7.
3. Close the pressure release valve on the manometer inflation bulb and slowly pump up the pressure to 200 mmHg ± 2 mmHg, as indicated by the manometer.
4. Verify that the manometer pressure does not fall by more than 5 mmHg in 60 seconds. If it does, either the cuff or hose or both may be defective. If the cuff and hose pass this test reconnect as shown in Figure 6-6. Pump up the cuff and hose to 200 mmHg, ± 2 mmHg, and perform the same leak check to determine if the leak is, in fact in the monitor. Perform this leak check for all cuff and hose combinations used with the monitor.

CUFF AND HOSE LEAK CHECK
Continued

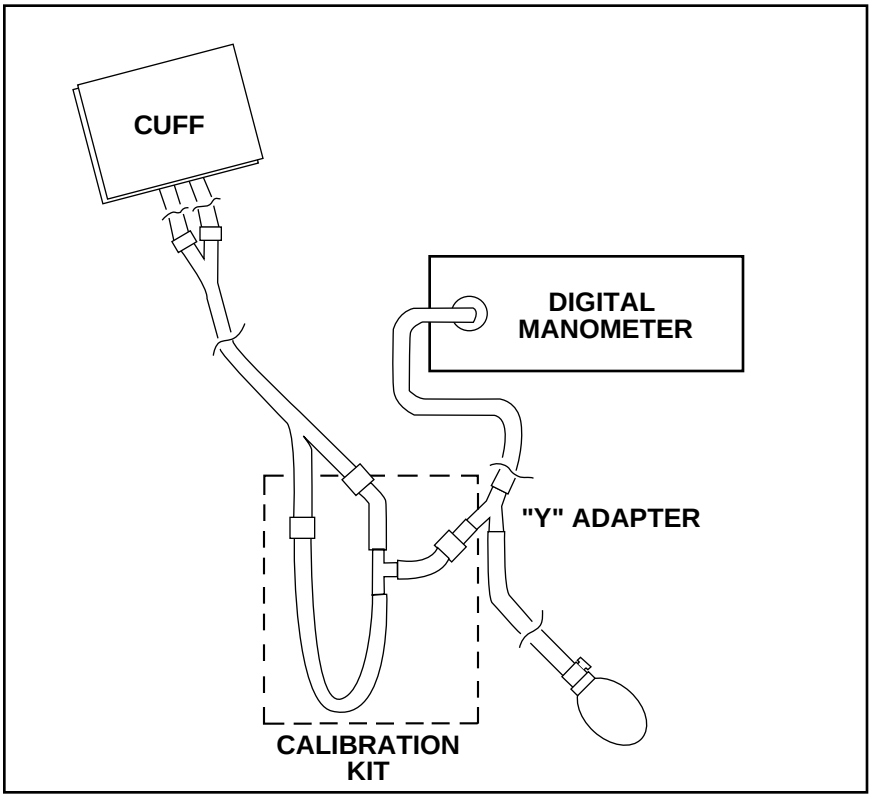

Figure 6-7. Cuff and Hose Leak Check Setup